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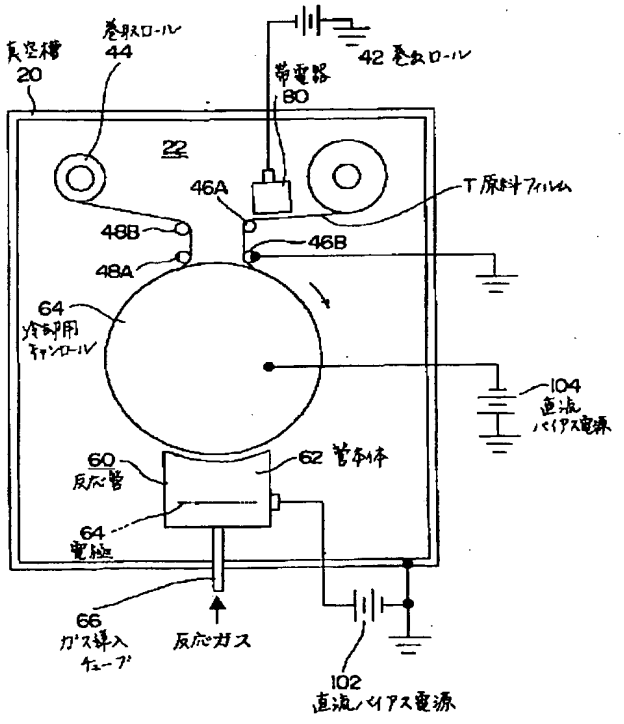
(54)【発明の名称】　プラズマＣＶＤ成膜装置

(57)【要約】
【課題】　原料フィルムと冷却用キャンロールとを適正に密着させることができ、原料フィルムが熱変形を生じた場合等でも膜厚のバラツキ等の不具合を生じることなく成膜できるプラズマＣＶＤ成膜装置を提供する。
【解決手段】　真空槽２０の処理室２２内に巻出ロール４２から冷却用キャンロール６４を経由して巻取ロール４４に原料テープＴを走行可能に掛装するとともに、冷却用キャンロール６４に巻き掛けられた原料テープＴと対向してプラズマを生じる反応管６０を設ける。原料テープＴの走行経路には冷却用キャンロール６４よりも上流側に原料テープＴのフィルム基体に電子線を照射してフィルム基体を負に帯電させる帯電器８０を設ける。また、冷却用キャンロール６４は導電性金属のロール本体６４ａ周面に絶縁層６４ｂを形成して構成し、ロール本体６４ａを直流バイアス電源１０４の負端子に接続して負電圧を印加し、絶縁層６４ｂ表面を正に帯電させる。



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【特許請求の範囲】

【請求項１】　原料ガスの供給および減圧が可能な真空槽内に冷却用キャンロールおよび電極を配置し、基体フィルム一面に導電性一次薄膜が形成された原料フィルムを前記冷却用キャンロールの電極と対向する周面に沿わせて走行させつつ前記電極に電圧を印加し、前記原料フィルムの導電性一次薄膜上に二次薄膜を形成するプラズマＣＶＤ成膜装置において、

前記冷却用キャンロールを正または負の一方に帯電するロール帯電手段と、

前記冷却用キャンロールより前記原料フィルムの走行方向上流側に設けられ、前記フィルム基体を前記冷却用キャンロールと異なる極性に帯電させるフィルム帯電手段と、

を備えることを特徴とするプラズマＣＶＤ成膜装置。

【請求項２】　前記冷却用キャンロールが導電性金属のロール本体の周面に絶縁性の被覆層を形成してなり、前記ロール帯電手段が前記ロール本体を絶縁して回転自在に支持する絶縁軸受けと、前記ロール本体にバイアス電圧を印加する直流バイアス電源とを備えることを特徴とする請求項１記載のプラズマＣＶＤ成膜装置。

【請求項３】　前記バイアス電圧が３００Ｖ以上１０００Ｖ以下の正電圧、または、－３００Ｖ以下－１０００Ｖ以上の負電圧であることを特徴とする請求項２記載のプラズマＣＶＤ成膜装置。

【請求項４】　前記冷却用キャンロールが導電性金属のロール本体の周面に絶縁性の第１被覆層、導電性の第２被覆層および絶縁性の第３被覆層を形成してなり、前記ロール帯電手段が前記第２被覆層にバイアス電圧を印加する直流バイアス電源を備えることを特徴とする請求項１記載のプラズマＣＶＤ成膜装置。

【請求項５】　前記バイアス電圧が３００Ｖ以上１０００Ｖ以下の正電圧、または、－３００Ｖ以下－１０００Ｖ以上の負電圧であることを特徴とする請求項４記載のプラズマＣＶＤ成膜装置。

【請求項６】　前記フィルム帯電手段が前記原料フィルムのフィルム基体に電子線を照射する電子線照射器からなることを特徴とする請求項１記載のプラズマＣＶＤ成膜装置。

【請求項７】　前記フィルム帯電手段が前記原料フィルムの走行経路に前記冷却用キャンロールよりも上流側で前記フィルム基体と接触可能に設けられた導電性の帯電ローラと、該帯電ローラにバイアス電圧を印加する直流バイアス電源とを備えることを特徴とする請求項１記載のプラズマＣＶＤ成膜装置。

【請求項８】　前記バイアス電圧が１００Ｖ以上１０００Ｖ以下の正電圧、または、－１００Ｖ以下－１０００Ｖ以上の負電圧であることを特徴とする請求項７記載のプラズマＣＶＤ成膜装置。

【発明の詳細な説明】

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【０００１】

【発明の属する技術分野】本発明は、磁気テープやＬＳＩ等の製造に用いられるプラズマＣＶＤ成膜装置に関する。

【０００２】

【従来の技術】オーディオテープやビデオテープ等の磁気テープは、ポリエチレンテレフタレート等の絶縁性樹脂のフィルム基体に、コバルトやニッケル等の金属磁性材料の磁性層（導電性一次薄膜）を形成し、また、この磁性層上にプラズマ重合膜等の保護層（二次薄膜）を形成して構成される。そして、一般に、保護層は、プラズマＣＶＤ成膜装置を用いて、すなわち、フィルム基体に導電性一次薄膜が形成された原料フィルムを冷却用キャンロールに沿わせて走行させ、この導電性一次薄膜上にプラズマＣＶＤ法にて蒸着で二次薄膜を形成する。

【０００３】ところが、上述したプラズマＣＶＤ成膜装置は、フィルム基体の熱変形等に起因してキャンロールとの密着性が損なわれ易く、薄膜を安定的に形成することが困難という不都合があった。そこで、従来、キャンロール周面とフィルム基体との密着性の改善を図ったプラズマＣＶＤ成膜装置が種々提案され、この種のプラズマＣＶＤ成膜装置として特開平２－２３９４２８号公報に記載されたものが知られる。

【０００４】上述した特開平２－２３９４２８号公報には、フィルム基体に電子線を照射し、この後に、フィルム基体を冷却用キャンロールと接触させて成膜するプラズマＣＶＤ成膜装置が記載される。この成膜装置は、原料フィルムに電子線を照射して原料フィルムを負に帯電させ、キャンロール周面に正の電荷を誘起させて原料フィルムとキャンロールとの間に生じる電気的引力で原料フィルムをキャンロール周面に密着させる。

【０００５】

【発明が解決しようとする課題】しかしながら、上述した特開平２－２３９４２８号公報に記載のプラズマＣＶＤ成膜装置にあっては、キャンロール周面に正の電荷が安定的に誘起されず、電気的引力が不安定になるという問題、また、原料フィルムの蒸着面に電子線を照射するためキャンロールとの接触面における帯電が不安定という問題があった。特に、後者の問題は、フィルム基体に金属薄膜が形成された原料フィルムを用いる場合、すなわち、ＤＣプラズマＣＶＤ装置においては顕著であると考えられ、その解決が強く要望される。本発明は、上記問題に鑑みてなされたもので、原料フィルムとキャンロールとの間に適正な電気的引力を安定的に得られるプラズマＣＶＤ成膜装置を提供することを目的とする。

【０００６】

【課題を解決するための手段】上記目的を達成するため本発明は、原料ガスの供給および減圧が可能な真空槽内に冷却用キャンロールおよび電極を配置し、基体フィルム一面に導電性一次薄膜が形成された原料フィルムを前

記冷却用キャンロールの電極と対向する周面に沿わせて走行させつつ前記電極に電圧を印加し、前記原料フィルムの導電性一次薄膜上に二次薄膜を形成するプラズマＣＶＤ成膜装置において、前記冷却用キャンロールを正または負の一方に帯電するロール帯電手段と、前記冷却用キャンロールより前記原料フィルムの走行方向上流側に設けられ、前記フィルム基体を前記冷却用キャンロールと異なる極性に帯電させるフィルム帯電手段とを設けたことを特徴とする。

【０００７】本発明にかかるプラズマＣＶＤ成膜装置は、冷却用キャンロールが正負いずれか一方に、原料フィルムのフィルム基体が冷却用キャンロールと逆の極性に帯電する。このため、冷却用キャンロールと原料フィルムとの間に適正な電気的引力が得られ、原料フィルムのフィルム基体を適正な密着力で冷却用キャンロールの周面に密着させることができ、二次薄膜を安定的に成膜できる。

【０００８】

【発明の実施の形態】以下、本発明の実施の形態を図面を参照して説明する。図１から図３は本発明の一の実施の形態にかかるプラズマＣＶＤ成膜装置を示し、図１が同プラズマＣＶＤ成膜装置の模式構成図、図２が同プラズマＣＶＤ成膜装置の一の要部を模式的に示す斜視図、図３が同プラズマＣＶＤ成膜装置の他の要部を模式的に示す断面図である。

【０００９】図１において、２０は内部に処理室２２を画成する真空槽であり、真空槽２０はステンレス等から構成され、その槽壁が直流高圧電源１０２に接続されて所定のプラス電位に保持される。この真空槽２０の処理室２２内には、上部に水平方向に間隔を隔て巻出ロール４２と巻取ロール４４が、中央部に冷却用キャンロール６４が、巻出ロール４２および巻取ロール４４と冷却用キャンロール６４との間にそれぞれ一対のパスロール４６Ａ，４６Ｂ、４８Ａ，４８Ｂが回転自在に取り付けられ、また、巻出ロール４２とパスロール４６Ａとの間に帯電器（フィルム帯電手段、電子線照射器）８０が、下部に反応管６０が設けられる。

【００１０】巻出ロール４２には原料フィルムＴが巻回され、巻取ロール４４は回転駆動機構に連結されて回転駆動される。そして、巻出ロール４２からパスロール４６Ａ，４６Ｂ、冷却用キャンロール６４およびパスロール４８Ａ，４８Ｂを経由して原料フィルムＴが巻取ロール４４に走行可能に巻き取られ、原料フィルムＴは巻取ロール４４の回転で走行する。図示は省略するが、原料フィルムＴは、ポリエチレンテレフタレート等のフィルム基体の一面に磁性層（導電性一次薄膜）を形成したもので、冷却用キャンロール６４周面にフィルム基体が接触する状態で巻き掛けられる。

【００１１】パスロール４６Ａ，４６Ｂ，４８Ａ，４８Ｂは、原料フィルムＴの磁性層形成面に接触（転動）し、走行を案内する。そして、１つのパスロール４６Ｂは、導電性を有し、電気的に接地される。この導電性のパスロール４６Ｂは、原料フィルムＴの磁性層と接触し、磁性層を一定電位に保持する。なお、パスロール４６Ｂは、バイアス電源と接続して所定のマイナス電位に保持することも可能であり、また、所定の抵抗値の半導体材料等で構成することもできる。

【００１２】帯電器８０は、図２に示すように、原料フィルムＴ側が開口した筐体８２内に電子銃８４を収納して構成される。筐体８２は、原料フィルムＴのフィルム基体面と所定の間隙δ（通常、２mm以下）の間隙を隔て設置され、筐体８２内面は電気的に接地される。電子銃８４は、周知のもの、例えば、市販品である「Ｈｏｌｌｏｗ　Ｃａｔｈｏｄｅ　Ｎｅｕｔｒａｌｉｚｅｒ」（Ｉｏｎ　Ｔｅｃｈ（株）製商品名）等が用いられ、原料フィルムＴの走行方向と直交する方向に拡がる扇状範囲Ｂに、すなわち、全幅にわたって電子線を照射する。

【００１３】冷却用キャンロール６４は、図３に示すように、両側にそれぞれ軸部６４ｃを一体に有する円筒状のロール本体６４ａの周面に絶縁層６４ｂを形成してなり、軸部６４ｃがベークライト等からなる絶縁性の軸受け６８を介して回転自在に支持される。ロール本体６４ａは、ステンレス等の導電性金属からなり、直流バイアス電源１０４に接続されて所定のマイナス電位に保持、例えば、－３００Ｖ以下－１０００Ｖ以上程度の電圧が印加される。絶縁層６４ｂは、セラミック等の絶縁性材料を０．５mm～１．０mm程度の厚みにコーティングして構成される。この絶縁層６４ｂは、ロール本体６４ａにマイナス電圧が印加されるため、表面が静電誘導によりプラスに帯電する。なお、冷却用キャンロール６４は回転駆動機構等により回転駆動され、また、内部に冷却水等が導入されるが、これらの構造については周知であるため説明を割愛する。

【００１４】反応管６０は、冷却用キャンロール６４側が円筒面状に開口した管本体６２内に電極６５を有し、また、管本体６２下部にガス導入チューブ６６が開口する。電極６５は直流高圧電源１０２のプラス端子と接続され、ガス導入チューブ６６は図外の反応ガス供給源と連絡して管本体６２内に反応ガスを導入する。なお、この反応管６０は周知であり、詳細な説明は割愛する。

【００１５】本実施の形態にあっては、巻出ロール４２から繰り出された原料フィルムＴが冷却用キャンロール６４の周面に沿って走行して巻取リール４４に巻き取られ、この走行する原料フィルムＴの磁性層形成面に反応管６０で保護膜（二次薄膜）等を形成する。すなわち、周知のように、反応管６０内に導入された反応ガスが電極６５を通過する時にプラズマとなり、原料ガス中の分子が分解されてプラスのラジカルとなり、パスロール４６Ｂを介して電気的に接地された原料フィルムＴの磁性層表面に付着して保護膜を形成する。

【００１６】ここで、保護膜の形成、すなわち、原料フィルムＴの走行に際しては、原料フィルムＴはフィルム基体が巻出ロール４２とパスロール４６Ａの間で帯電器８０により電子線を照射されてマイナスに帯電し、また、冷却用キャンロール６４はロール本体６４ａにマイナス電圧が印加されて絶縁層６４ｂ表面がプラスに帯電する。このため、原料フィルムＴのフィルム基体と冷却用キャンロール６４の絶縁層６４ｂ表面との間には適正な電気的引力が発生し、原料フィルムＴのフィルム基体面と冷却用キャンロール６４の絶縁層６４ｂ表面とを適正な密着力で密着させることができる。したがって、原料フィルムＴに熱変形等が生じた場合にも適正に成膜でき、膜厚ムラの発生等を防止できる。

【００１７】図４および図５は本発明の他の実施の形態にかかるプラズマＣＶＤ成膜装置を示し、図４が全体を模式的に示す構成図、図５ａが要部を模式的に示す断面図、図５ｂが図５ａの一部を拡大した模式図である。なお、上述した実施の形態と同一の部分には同一の番号（符号）を付して説明を割愛する。

【００１８】本実施の形態は、パスロール４６Ａ，４６Ｂ間のテープ走行経路に原料フィルムＴのフィルム基体表面と接触する帯電ロール８８を設ける。この帯電ロール８８は、ステンレス等の導電性材料から構成され、直流バイアス電源１０６のプラス端子に接続されて１００Ｖ以上１０００Ｖ以下程度のプラスの電圧が印加される。この帯電ロール８８は、走行する原料フィルムＴのフィルム基体面と接触（転動）し、フィルム基体面をプラスに帯電させる。

【００１９】また、冷却用キャンロール６４は、図５（ａ），（ｂ）に示すように、ロール本体６４ａの周面に第１の絶縁層６４ｅ、導電層６４ｆおよび第２の絶縁層６４ｇが形成される。第１の絶縁層６４ｅは、セラミック等の絶縁性材料を０．５ｍｍ程度の厚みにコーティングして形成され、ロール本体６４ａの全周面を覆う。第２の絶縁層６４ｇは、第１の絶縁層６４ｅと同様にセラミック等の絶縁性材料を０．５ｍｍ程度の厚みにコーティングして形成され、導電層６４ｆの側部を除く表面を覆う。この第２の絶縁層６４ｇは、導電層６４ｆへのプラス電圧の印加で静電誘導により表面がマイナスに帯電する。なお、軸受け６８は導電性、絶縁性を問わず使用できる。

【００２０】導電層６４ｆは、アルミニウムや銀の導電性材料を０．３ｍｍ程度の厚みに溶射等でコーティングして構成される。導電層６４ｆは、露呈する側部表面にスリップリング６４ｈが設けられ、このスリップリング６４ｈに摺動自在に嵌合するシュー６４ｉを介して直流バイアス電源１０８に接続される。導電層６４ｆは、直流バイアス電源１０８により３００Ｖ以上１０００Ｖ以下のプラスの電圧が印加される。

【００２１】本実施の形態にあっては、原料フィルムＴのフィルム基体表面が帯電ロール８８によりプラスに帯電され、冷却用キャンロール６４は最外層の第２の絶縁層６４ｇの表面が導電層６４ｆに印加されるプラスの電圧でマイナスに帯電する。このため、前述した実施の形態と同様に、原料フィルムＴのフィルム基体と冷却用キャンロール６４の第２の絶縁層６４ｇ表面との間には適正な電気的引力が発生し、原料フィルムＴのフィルム基体面を冷却用キャンロール６４に適正な密着力で密着させることができ、原料フィルムＴに熱変形等が生じた場合にも適正に成膜でき、膜厚ムラの発生等を防止できる。

【００２２】なお、上述した実施の形態において、冷却用キャンロール６４の表面をマイナスに帯電させるには類似の構造を採用して印加電圧の極性を逆にすることでも可能である。すなわち、図６に示すように、冷却用キャンロール６４を導電性のロール本体６４ａ表面に１層の絶縁層６４ｂを形成し、ロール本体６４ａを直流バイアス電源１０４のプラス端子に接続することでも絶縁層６４ｂの表面をマイナスに帯電させることができる。

【００２３】また、上述した各実施の形態においては、ＤＣプラズマＣＶＤ成膜装置を例示するが、本発明は高周波プラズマＣＶＤ成膜装置にも適用することが可能である。

【００２４】

【発明の効果】以上説明したように本発明にかかるプラズマＣＶＤ成膜装置によれば、キャンロールの表面を正負の一方に帯電させるとともに、フィルム原料のフィルム基体を正負の他方に帯電させるため、フィルム原料と冷却用キャンロールとの間に適正な電気的引力が得られ、フィルム原料と冷却用キャンロールとの密着性を改善でき、フィルム原料に熱変形等が生じた場合でも適正に成膜でき、膜厚のムラの発生等が防止できる。

【図面の簡単な説明】

【図１】本発明の一の実施の形態にかかるプラズマＣＶＤ成膜装置を示す全体模式構成図である。

【図２】同プラズマＣＶＤ成膜装置の要部を拡大して示す模式斜視図である。

【図３】同プラズマＣＶＤ成膜装置の他の要部を拡大して示す模式断面図である。

【図４】本発明の他の実施の形態にかかるプラズマＣＶＤ成膜装置を示す全体模式構成図である。

【図５】同プラズマＣＶＤ成膜装置の要部を模式的に示し、（ａ）が断面図、（ｂ）がａのＡ部拡大図である。

【図６】同プラズマＣＶＤ成膜装置の要部の他の態様を示す模式断面図である。

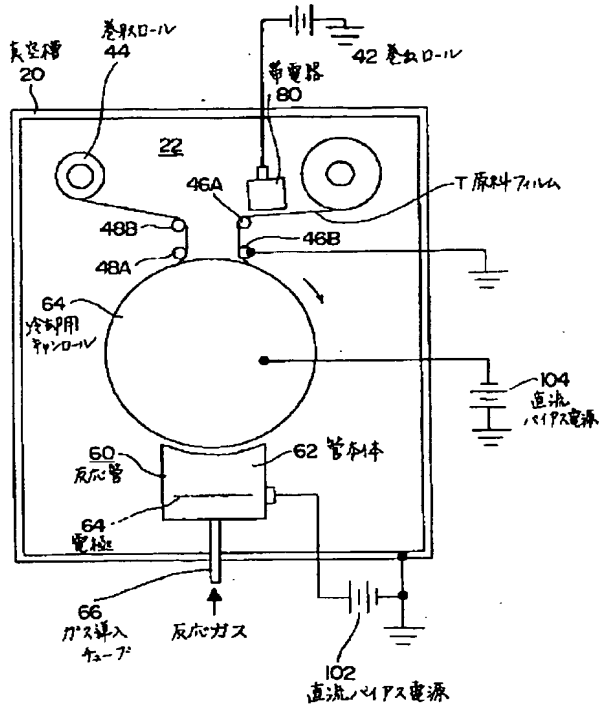
【符号の説明】

２０……真空槽、２２……処理室、４２……巻出ロール、４４……巻取ロール、４６Ａ，４６Ｂ，４８Ａ，４８Ｂ……パスロール、６０……反応管、６２……管本体、６５……電極、６４……冷却用キャンロール、６４

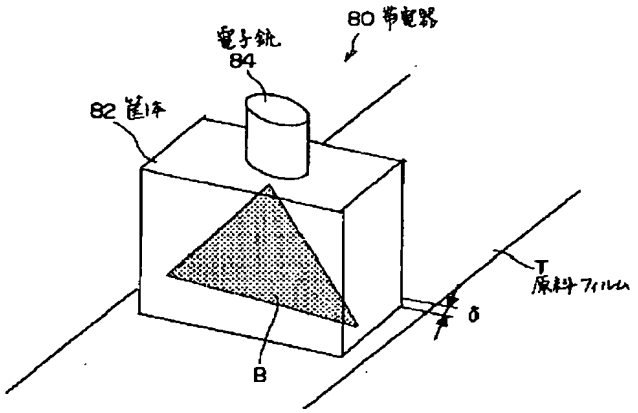
ａ……ロール本体、６４ｂ……絶縁層、６４ｅ……第１の絶縁層、６４ｆ……導電層、６４ｇ……第２の絶縁層、６６……ガス導入チューブ、８０……帯電器（フィルム帯電手段、電子線照射器）、８２……筐体、８４…＊

＊…電子銃、１０２……直流高圧電源、１０６……直流バイアス電源、１０８……直流バイアス電源、Ｔ……原料フィルム。

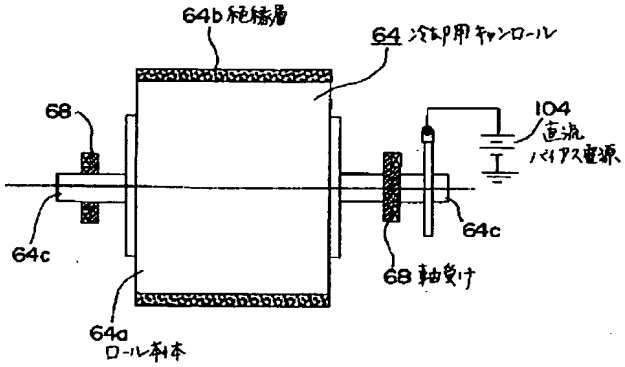
【図１】



【図２】



【図３】



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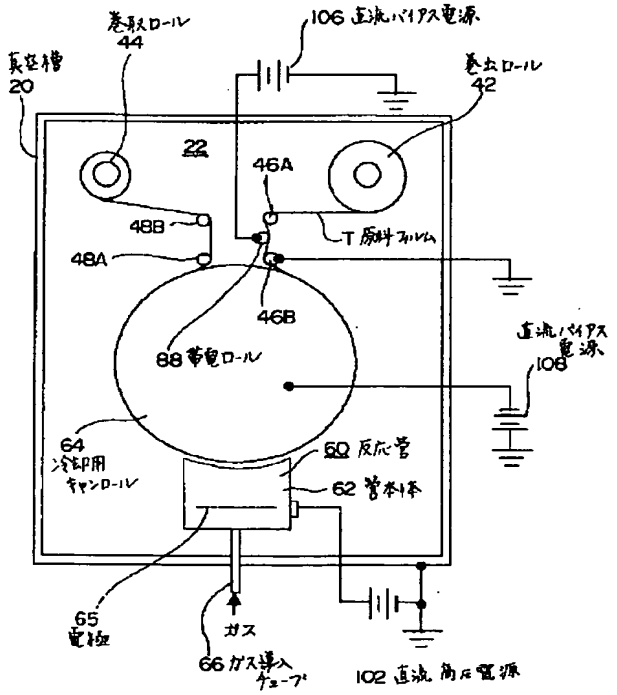

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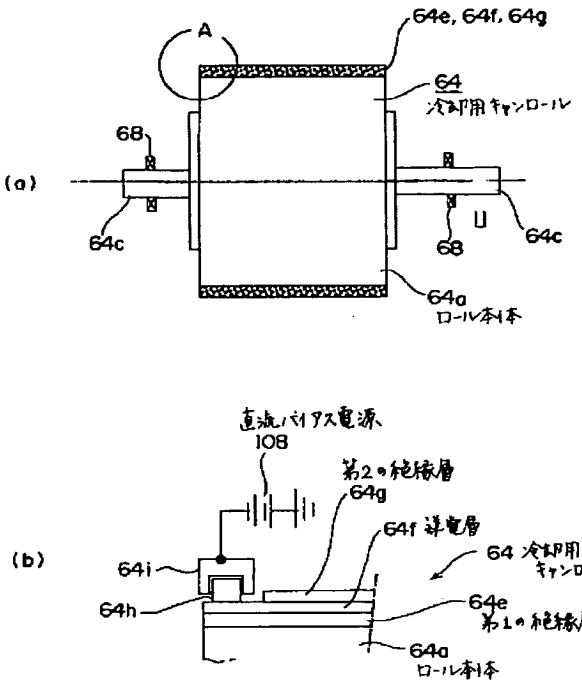
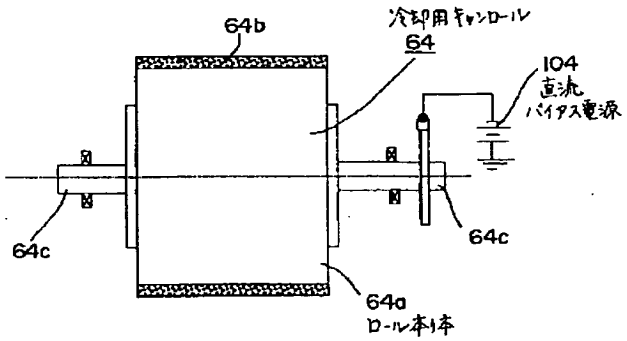


【図６】



フロントページの続き

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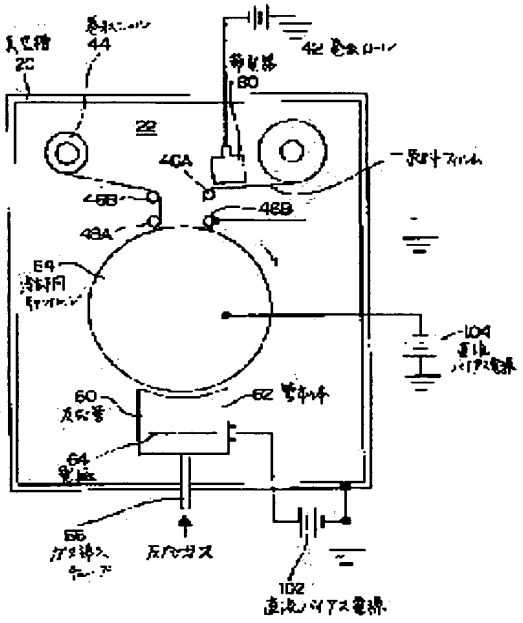
(54) PLASMA ASSISTED CVD DEPOSITION APPARATUS

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a plasma assisted CVD deposition apparatus capable of adequately bringing a raw material film and a cooling can roll into tight contact with each other and executing deposition without the occurrence of trouble, such as variation in film thickness, even when the raw material film gives rise to thermal deformation.
SOLUTION: The raw material tape T is travelably wound around a take-up roll 44 through the cooling can roll 64 from an un-winding roll 42 in a processing chamber 22 of a vacuum vessel 20. A reaction tube 60 which generates a plasma is disposed to face the raw material tape T wound around the cooling can roll 64. The traveling route of the raw material tape T is provided with an electrifier 80 which electrifies a film substrate negative by irradiating the film substrate of the raw material tape T with an electron beam on the upstream side of the cooling can roll 64. In addition, the cooling can roll 64 is constituted by forming an insulating layer on the peripheral surface of the roll body made of a conductive metal. The roll body is connected to the negative terminal of a DC bias power source 104 and negative voltage is impressed to the roll body to electrify the surface of the insulating layer positive.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The can roll for cooling and an electrode are arranged in the vacuum tub in which supply and reduced pressure of material gas are possible. An electrical potential difference is impressed to said electrode, making the raw material film with which the conductive primary thin film was formed in the base film whole surface meet the electrode of said can roll for cooling, and the peripheral surface which counters, and making it run a film. In the plasma-CVD membrane formation equipment which forms a secondary thin film on the conductive primary thin film of said raw material film A roll electrification means by which said can roll for cooling is charged in either forward or negative, Plasma-CVD membrane formation equipment characterized by having a film electrification means for it to be prepared in the transit direction upstream of said raw material film from said can roll for cooling, and to electrify said film base in a different polarity from said can roll for cooling.
[Claim 2] Plasma-CVD membrane formation equipment according to claim 1 characterized by having the insulating bearing which said can roll for cooling comes to form an insulating enveloping layer in the peripheral surface of the body of a roll of a conductive metal, and said roll electrification means insulates said body of a roll, and is supported free [rotation], and the direct-current bias power supply which impresses bias voltage to said body of a roll.
[Claim 3] Plasma-CVD membrane formation equipment according to claim 2 characterized by said bias voltage being a forward electrical potential difference not more than more than 300V1000V, or a negative electrical potential difference beyond less than [-300V]-1000V.
[Claim 4] Plasma-CVD membrane formation equipment according to claim 1 characterized by having the direct-current bias power supply to which said can roll for cooling comes to form the 1st enveloping layer, the 2nd conductive insulating enveloping layer, and the 3rd insulating, insulating enveloping layer in the peripheral surface of the body of a roll of a conductive metal, and said roll electrification means impresses bias voltage to said 2nd enveloping layer.
[Claim 5] Plasma-CVD membrane formation equipment according to claim 4 characterized by said bias voltage being a forward electrical potential difference not more than more than 300V1000V, or a negative electrical potential difference beyond less than [-300V]-1000V.
[Claim 6] Plasma-CVD membrane formation equipment according to claim 1 characterized by said film electrification means becoming the film base of said raw material film from the electron beam irradiation which irradiates an electron ray.
[Claim 7] Plasma-CVD membrane formation equipment according to claim 1 characterized by having the direct-current bias power supply which impresses bias voltage to the electrification roller and this electrification roller of the conductivity by which said film electrification means was formed in the transit path of said raw material film possible [said film base and contact] at the upstream rather than said can roll for cooling.
[Claim 8] Plasma-CVD membrane formation equipment according to claim 7 characterized by said bias voltage being a forward electrical potential difference not more than more than 100V1000V, or a negative electrical potential difference beyond less than [-100V]-1000V.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the plasma-CVD membrane formation equipment used for manufacture of a magnetic tape, LSI, etc.
[0002]
[Description of the Prior Art] Magnetic tapes, such as an audio tape and a video tape, form the magnetic layer (conductive primary thin film) of metal magnetic materials, such as cobalt and nickel, and form protective layers (secondary thin film), such as plasma polymerization film, on this magnetic layer, and are constituted by the film base of insulating resin, such as polyethylene terephthalate. And generally, a protective layer makes the can roll for cooling meet, makes it run the raw material film with which the conductive primary thin film was formed in the film base, using plasma-CVD membrane formation equipment, and forms a secondary thin film by vacuum evaporationo by the plasma-CVD method on this conductive primary thin film.
[0003] however, having originated in heat deformation of a film base etc., the adhesion with a can roll having been easy to be spoiled, and the plasma-CVD membrane formation equipment mentioned above having un-arranged [which it is called / forming a thin film stably and / difficulty]. Then, conventionally, the plasma-CVD membrane formation equipment which aimed at the improvement of the adhesion of a can roll peripheral surface and a film base is proposed variously, and what was indicated by JP,2-239428,A as this kind of plasma-CVD membrane formation equipment is known.
[0004] An electron ray is irradiated at a film base and the plasma-CVD membrane formation equipment which a film base is contacted on the can roll for cooling, and forms membranes next is indicated by JP,2-239428,A mentioned above. This membrane formation equipment irradiates an electron ray at a raw material film, electrifies a raw material film in negative, and sticks a raw material film to a can roll peripheral surface by the electric attraction which is made to carry out induction of the positive charge to a can roll peripheral surface, and is produced between a raw material film and a can roll.
[0005]
[Problem(s) to be Solved by the Invention] However, if it was in plasma-CVD membrane formation equipment given in JP,2-239428,A mentioned above, induction of the positive charge was not stably carried out to a can roll peripheral surface, but since an electron ray was irradiated in the problem that electric attraction becomes unstable, and the vacuum evaporationo side of a raw material film, there was a problem that electrification in the contact surface with a can roll was unstable. When the raw material film with which the metal thin film was formed in the film base is used especially for the latter problem, it is thought in DC plasma-CVD equipment that it is remarkable, and the solution is demanded strongly. This invention was made in view of the above-mentioned problem, and aims at offering the plasma-CVD membrane formation equipment which can acquire proper electric attraction stably between a raw material film and a can roll.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, this invention arranges the can roll for cooling, and an electrode in the vacuum tub in which supply and reduced pressure of material gas are possible. An electrical potential difference is impressed to said electrode, making the raw material film with which the conductive primary thin film was formed in the base film whole surface meet the electrode of said can roll for cooling, and the peripheral surface which counters, and making it run a film. In the plasma-CVD membrane formation equipment which forms a secondary thin film on the conductive primary thin film of said raw material film A roll electrification means by which said can roll for

cooling is charged in either forward or negative, It is characterized by having been prepared in the transit direction upstream of said raw material film from said can roll for cooling, and establishing a film electrification means to electrify said film base in a different polarity from said can roll for cooling.
[0007] As for the plasma-CVD membrane formation equipment concerning this invention, the can roll for cooling is charged at one of positive/negative in a polarity with the film base of a raw material film contrary to the can roll for cooling. For this reason, electric attraction proper between the can roll for cooling and a raw material film is acquired, the film base of a raw material film can be stuck to the peripheral surface of the can roll for cooling by the proper adhesion force, and a secondary thin film can be formed stably.
[0008]
[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing. They are the perspective view in which drawing 3 shows the plasma-CVD membrane formation equipment concerning the gestalt of operation of one of this invention from drawing 1 , drawing 1 shows the ** type block diagram of this plasma-CVD membrane formation equipment, and drawing 2 shows typically the important section of 1 of this plasma-CVD membrane formation equipment, and the sectional view in which drawing 3 shows typically other important sections of this plasma-CVD membrane formation equipment.
[0009] In drawing 1 , 20 is a vacuum tub which forms the processing room 22 inside, the vacuum tub 20 consists of stainless steel etc., and the tank wall is connected to the direct-current high voltage power supply 102, and it is held at predetermined plus potential. In the processing room 22 of this vacuum tub 20, spacing is horizontally separated in the upper part. The **** roll 42 and the winding roll 44 The can roll 64 for cooling in the center section, respectively between the **** roll 42 and the winding roll 44, and the can roll 64 for cooling The pass rolls 46A and 46B of a pair, It is attached free [rotation of 48A and 48B], and a coil 60 is formed for the electrification machine (a film electrification means, electron beam irradiation) 80 in the lower part between the **** roll 42 and pass roll 46A.
[0010] The raw material film T is wound around the **** roll 42, the winding roll 44 is connected with a rotation drive, and a rotation drive is carried out. And the raw material film T is rolled round by the winding roll 44 possible [transit] from the **** roll 42 via the pass rolls 46A and 46B, the can roll 64 for cooling, and the pass rolls 48A and 48B, and the raw material film T runs by rotation of the winding roll 44. Although illustration is omitted, the raw material film T is what formed the magnetic layer (conductive primary thin film) in the whole surface of film bases, such as polyethylene terephthalate, and is almost rolled in the condition that a film base contacts can roll 64 peripheral surface for cooling.
[0011] The pass rolls 46A, 46B, 48A, and 48B contact the magnetic layer forming face of the raw material film T (rolling), and guide transit. And one pass roll 46B has conductivity, and is grounded electrically. This conductive pass roll 46B contacts the magnetic layer of the raw material film T, and holds a magnetic layer to fixed potential. In addition, pass roll 46B can also consist of semiconductor materials of predetermined resistance etc. possible [connecting with bias power supply and also holding to predetermined minus potential].
[0012] As shown in drawing 2 , in the case 82 in which the raw material film T side carried out opening, the electrification machine 80 contains an electron gun 84, and is constituted. A case 82 separates the gap of the film base side of the raw material film T, and the predetermined gap delta (usually 2mm or less), and is installed, and case 82 inside is grounded electrically. "Hollow Cathode Neutralizer" (trade name made from Ion Tech) etc. which is a well-known thing, for example, a commercial item, is used, and an electron gun 84 irradiates an electron ray over the flabellate form range B, i.e., full, which spreads in the transit direction of the raw material film T, and the direction which intersects perpendicularly.
[0013] The can roll 64 for cooling is supported free [rotation] through the insulating bearing 68 to which it comes to form insulating-layer 64b in the peripheral surface of cylinder-like body of roll 64a which has shank 64c on both sides at one, respectively, and shank 64c becomes it from a bakelite etc., as shown in drawing 3 . Body of roll 64a consists of conductive metals, such as stainless steel, it connects with the direct-current bias power supply 104, and the electrical potential difference of maintenance, for example, or more [or less / -300 / V-1000] V extent, is impressed to predetermined minus potential. Insulating-layer 64b coats the thickness of 0.5mm - about 1.0mm with insulating ingredients, such as a ceramic, and is constituted. Since a minus electrical potential difference is impressed to body of roll 64a, as for this insulating-layer 64b, a front face is charged in plus by electrostatic induction. In addition, about such structures, although the rotation drive of the can roll 64 for cooling is carried out by a rotation drive etc. and cooling water etc. is introduced into the interior, since it is common knowledge, explanation is omitted.
[0014] A coil 60 has an electrode 65 in the body 62 of tubing in which the can roll 64 side for cooling carried out opening to the shape of a cylinder side, and the gas installation tube 66 carries out opening to

the body of tubing 62 lower part. An electrode 65 is connected with the plus terminal of the direct-current high voltage power supply 102, and the gas installation tube 66 is connected with the reactant gas source of supply outside drawing, and introduces reactant gas in the body 62 of tubing. In addition, this coil 60 is common knowledge and omits detailed explanation.

[0015] If it is in the gestalt of this operation, the raw material film T which it let out from the **** roll 42 runs in accordance with the peripheral surface of the can roll 64 for cooling, is rolled round by the take-up reel 44, and forms a protective coat (secondary thin film) etc. in the magnetic layer forming face of this raw material film T it runs with a coil 60. That is, when the reactant gas introduced in the coil 60 passes an electrode 65 as everyone knows, it becomes the plasma, and the molecule in material gas is disassembled, and it becomes radical [plus], it adheres to the magnetic layer front face of the raw material film T electrically grounded through pass roll 46B, and a protective coat is formed.

[0016] Here, on the occasion of formation of a protective coat, i.e., transit of the raw material film T, a film base can irradiate an electron ray with the electrification vessel 80 between the **** roll 42 and pass roll 46A, the raw material film T is charged in minus, and a minus electrical potential difference is impressed to body of roll 64a, and, as for the can roll 64 for cooling, an insulating-layer 64b front face is charged in plus. For this reason, proper electric attraction can occur between the film base of the raw material film T, and the insulating-layer 64b front face of the can roll 64 for cooling, and the film base side of the raw material film T and the insulating-layer 64b front face of the can roll 64 for cooling can be stuck by the proper adhesion force. Therefore, also when heat deformation etc. arises on the raw material film T, membranes can be formed proper, and generating of thickness nonuniformity etc. can be prevented.

[0017] Drawing 4 and drawing 5 show the plasma-CVD membrane formation equipment concerning the gestalt of other operations of this invention. The block diagram in which drawing 4 shows the whole typically, the sectional view in which drawing 5 a shows an important section typically, <A HREF="/Tokujitu/tjitemdrw.ipdl?N0000=239&N0500=1 E_N/;>=?>8;;?///&N0001=330&N0552=9&N 0553= 000007" TARGET="tjitemdrw"> drawing 5 b It is the mimetic diagram which expanded a part of drawing 5 a. In addition, the same number (sign) is given to the same part as the gestalt of operation mentioned above, and explanation is omitted.

[0018] The gestalt of this operation forms the electrification roll 88 in contact with the film base front face of the raw material film T in the tape transit path between pass roll 46A and 46B. This electrification roll 88 consists of conductive ingredients, such as stainless steel, it connects with the plus terminal of the direct-current bias power supply 106, and the electrical potential difference of plus of or less [or more / 100 / V1000] V extent is impressed. This electrification roll 88 contacts the film base side of the raw material film T it runs (rolling), and electrifies a film base side in plus.

[0019] Moreover, as the can roll 64 for cooling is shown in drawing 5 (a) and (b), the 1st insulating-layer 64e, 64f of conductive layers, and 64g of the 2nd insulating layer are formed in the peripheral surface of body of roll 64a. The thickness of about 0.5mm is coated with insulating ingredients, such as a ceramic, it is formed, and 1st insulating-layer 64e is a wrap about the perimeter side of body of roll 64a. The 64g of the 2nd insulating layer is a wrap about the front face coat the thickness of about 0.5mm with insulating ingredients, such as a ceramic, like 1st insulating-layer 64e, are formed, and excluding the flank of 64f of conductive layers. As for the 64g of this 2nd insulating layer, a front face is charged in minus by electrostatic induction in impression of 64f [of conductive layers] positive voltage. In addition, a bearing 68 can be used regardless of conductivity and insulation.

[0020] 64f of conductive layers coats aluminum and a conductive silver ingredient with thermal spraying etc. at the thickness of about 0.3mm, and they are constituted. Slip ring 64h is prepared in the flank front face to expose, and 64f of conductive layers is connected to the direct-current bias power supply 108 through shoe 64i which fits into this slip ring 64h free [sliding]. As for 64f of conductive layers, the electrical potential difference of plus not more than more than 300V1000V is impressed by the direct-current bias power supply 108.

[0021] If it is in the gestalt of this operation, the film base front face of the raw material film T is charged in plus with the electrification roll 88, and the can roll 64 for cooling is charged in minus on the electrical potential difference of the plus by which the front face of the 64g of the 2nd insulating layer of the outermost layer is impressed to 64f of conductive layers. For this reason, like the gestalt of operation mentioned above, proper electric attraction can occur between the film base of the raw material film T, and the 2nd 64g front face of insulating layers of the can roll 64 for cooling, and the film base side of the raw material film T can be stuck on the can roll 64 for cooling by the proper adhesion force, also when heat deformation etc. arises on the raw material film T, membranes can be formed proper, and generating of thickness nonuniformity etc. can be prevented.

[0022] In addition, in the gestalt of operation mentioned above, it is also possible to adopt structure similar to electrifying the front face of the can roll 64 for cooling in minus, and to make the polarity of applied voltage reverse. That is, as shown in drawing 6 , insulating-layer of one layer 64b can be formed in a conductive body of roll 64a front face for the can roll 64 for cooling, and connecting body of roll 64a to the plus terminal of the direct-current bias power supply 104 can also electrify the front face of insulating-layer 64b in minus.
[0023] Moreover, in the gestalt of each operation mentioned above, although DC plasma-CVD membrane formation equipment is illustrated, this invention can be applied also to RF plasma-CVD membrane formation equipment.
[0024]
[Effect of the Invention] As explained above, while electrifying the front face of a can roll in one side of positive/negative according to the plasma-CVD membrane formation equipment concerning this invention In order to electrify the film base of a film raw material on another side of positive/negative, electric attraction proper between a film raw material and the can roll for cooling is acquired. The adhesion of a film raw material and the can roll for cooling is improvable, even when heat deformation etc. arises in a film raw material, membranes can be formed proper, and generating of the nonuniformity of thickness etc. can be prevented.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the ****** type block diagram showing the plasma-CVD membrane formation equipment concerning the gestalt of operation of one of this invention.
[Drawing 2] It is the ** type perspective view expanding and showing the important section of this plasma-CVD membrane formation equipment.
[Drawing 3] It is the type section Fig. expanding and showing other important sections of this plasma-CVD membrane formation equipment.
[Drawing 4] It is the ****** type block diagram showing the plasma-CVD membrane formation equipment concerning the gestalt of other operations of this invention.
[Drawing 5] The important section of this plasma-CVD membrane formation equipment is shown typically, (a) is a sectional view and (b) is the A section enlarged drawing of a.
[Drawing 6] It is the type section Fig. showing other modes of the important section of this plasma-CVD membrane formation equipment.
[Description of Notations]
20 [.. Winding roll,] .... A vacuum tub, 22 .. A processing room, 42 .. A **** roll, 44 46A, 46B, 48A, 48B .... A pass roll, 60 .. Coil, 62 [.. The body of a roll,] .... The body of tubing, 65 .. An electrode, 64 .. The can roll for cooling, 64a 64b [.. The 2nd insulating layer,] .... An insulating layer, 64e .. The 1st insulating layer, 64f .. A conductive layer, 64g 66 [.. An electron gun, 102 / .. A direct-current high voltage power supply, 106 / .. Direct-current bias power supply, 108 / .. Direct-current bias power supply, T / .. Raw material film] .... A gas installation tube, 80 .. An electrification machine (a film electrification means, electron beam irradiation), 82 .. A case, 84

[Translation done.]